

Notice of Allowability

Application No.

10/512,039

Examiner

James A. Meyers

Applicant(s)

MIWA ET AL.

Art Unit

2622

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 24 September 2007.
2. ☒ The allowed claim(s) is/are 3-8, 10-16 and 19-22.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of the:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
- ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
- ☐ Notice of Informal Patent Application
- ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
- ☒ Examiner's Amendment/Comment
- ☒ Examiner's Statement of Reasons for Allowance
- ☐ Other _____

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. JAMES M. MOORE on 12/17/2007.

2. The application has been amended as follows:

Claim 3 (Currently amended): A camera calibrating apparatus to be operative in combination with an imaging device which includes a housing unit and an optical section supported by said housing unit to obtain image information through said optical section, and adapted to calibrate optical position information indicative of a position of said optical section, comprising:

first housing position information storing means for storing first housing position information indicative of a position of said housing unit in the first coordinate system in which a revising marker is located;

second housing position information storing means for storing second housing position information indicative of a position of said housing unit in the second coordinate system in which a calibrating marker is located;

first optical position information ~~producing~~ calculating means for ~~producing~~ calculating first optical position information indicative of a position of said optical section in said first coordinate system on the basis of said image information of said revising marker obtained by said imaging device;

first optical position information storing means for storing said first optical position information produced by said first optical position information producing means;

second optical position information ~~producing~~ calculating means for ~~producing~~ calculating second optical position information indicative of a position of said optical section to said second coordinate system from said second housing position information stored by said second housing position information storing means on the basis of said

first housing position information stored by said first housing position information storing means and said first optical position information stored by said first optical position information storing means;

estimated position information ~~producing~~ calculating means for ~~producing~~ calculating estimated position information indicative of a position of said calibrating marker to an image coordinate system of said imaging device on the basis of said second optical position information produced by said second optical position information producing means;

second optical position information storing means for storing said second optical position information produced by said second optical position information producing means;

estimated position information storing means for storing said estimated position information produced by said estimated position information producing means; and

calibrating means for calibrating said second optical position information stored by said second optical position information storing means on the basis of said image information of said calibrating marker obtained by said imaging device and said estimated position information stored by said estimated position information storing means.

Claim 8 (Currently amended): A camera calibrating apparatus to be operative in combination with an imaging device which includes a housing unit and an optical section supported by said housing unit to obtain image information through said optical section, and adapted to calibrate optical position information indicative of a position of said optical section, comprising:

first housing position information storing means for storing first housing position information indicative of a position of said housing unit in the first coordinate system in which a revising marker is located;

second housing position information storing means for storing second housing position information indicative of a position of said housing unit in the second coordinate system;

first optical position information ~~producing~~ calculating means for ~~producing~~ calculating first optical position information indicative of a position of said optical section in said first coordinate system on the basis of said image information obtained by said imaging device and indicative of said revising marker;

first optical position information storing means for storing said first optical position information produced by said first optical position information producing means;

second optical position information ~~producing~~ calculating means for ~~producing~~ calculating second optical position information indicative of a position of said optical section to said second coordinate system from said second housing position information stored by said second housing position information storing means on the basis of said first housing position information stored by said first housing position information storing means and Said first optical position information stored by said first optical position information storing means;

second optical position information storing means for storing said second optical position information produced by said second optical position information producing means; and

calibrating means for calibrating said second optical position information stored by said second optical position information storing means on the basis of a motion vector of said image information obtained by said imaging device in said second coordinate system,

wherein said calibrating means includes:

plane-projected image producing means for producing a plane-projected image from said image information obtained by said imaging device in said second coordinate system;

plane-projected image dividing means for dividing said plane-projected image produced by said plane-projected image producing means into a plurality of image segments;

motion vector extracting means for extracting said motion vector from said image segments divided by said plane-projected image dividing means;

calibration value calculating means for calculating a calibration value of said second optical position information stored by said second optical position information storing means on the basis of said motion vector extracted by said motion vector extracting means; and

optical position information calibrating means for calibrating said second optical position information stored by said second optical position information storing means on the basis of said calibration value calculated by said calibration value calculating means.

Claim 9 (Cancelled):

Claim 10 (Currently amended): A camera calibrating apparatus as set forth in claim [[9]] 8, in which

a dividing marker is located in said second coordinate system in a predetermined relationship with said position of said housing unit represented by said second position information stored by said second position information storing means, and in which

plane-projected image dividing means is adapted to divide said plane-projected image produced by said plane-projected image producing means into a plurality of image segments on the basis of said image information of said dividing marker obtained by said imaging device.

Claim 11 (Currently amended): A camera calibrating apparatus to be operative in combination with an imaging device which includes a housing unit and an optical section supported by said housing unit to obtain image information through said optical section, and adapted to calibrate position information of said optical section, comprising:

first housing position information storing means for storing first housing position information indicative of a position of said housing unit in the first coordinate system in which a revising marker is located;

second housing position information storing means for storing second housing position information indicative of a position of said housing unit in the second coordinate system in which an automotive vehicle is located;

first optical position information ~~producing~~ calculating means for ~~producing~~ calculating first optical position information indicative of a position of said optical section in said first coordinate system on the basis of said image information of said revising marker obtained by said imaging device;

first optical position information storing means for storing said first optical position information produced by said first optical position information producing means;

second optical position information ~~producing~~ calculating means for ~~producing~~ calculating second optical position information indicative of a position of said optical section to said second coordinate system from said second housing position information stored by said second housing position information storing means on the basis of said first housing position information stored by said first housing position information storing means and said first optical position information stored by said first optical position information storing means;

estimated position information ~~producing~~ calculating means for ~~producing~~ calculating estimated position information indicative of a position of said automotive vehicle to an image coordinate system of said imaging device on the basis of said second optical position information produced by said second optical position information producing means;

second optical position information storing means for storing said second optical position information produced by said second optical position information producing means;

estimated position information storing means for storing said estimated position information produced by said estimated position information estimating means; and

calibrating means for calibrating said second optical position information stored by said second optical position information storing means on the basis of said image information of said automotive vehicle obtained by said imaging device and said estimated position information stored by said estimated position information storing means.

Claim 14 (Currently amended): A camera calibrating apparatus as set forth in any one of claims 3 to 8 and 10 to 13, in which said imaging device is mounted on an automotive vehicle.

Claim 15 (Currently amended): An imaging system comprises a camera calibrating apparatus as set forth in any one of claims [[1]] 3 to 8 and 10 to 13.

Claim 16 (Currently amended): An imaging control system comprises a camera calibrating apparatus as set forth in any one of claims [[1]] 3 to 8 and 10 to 13.

Claim 19 (Currently amended): A camera calibrating method of calibrating optical position information indicative of a position of an optical section supported by a housing unit of a camera for obtaining image information through said optical section, comprising:

a first housing position information storing step of storing first housing position information indicative of a position of said housing unit in the first coordinate system in which a revising marker is located;

a second housing position information storing step of storing second housing position information indicative of a position of said housing unit in the second coordinate system in which a calibrating marker is located;

a first optical position information ~~producing~~ calculating step of ~~producing~~ calculating first optical position information indicative of a position of said optical section in said first coordinate system on the basis of said image information of said revising marker obtained by said imaging device;

a first optical position information storing step of storing said first optical position information produced in said first optical position information producing step;

a second optical position information ~~producing~~ calculating step of ~~producing~~ calculating second optical position information indicative of a position of said optical

section to said second coordinate system from said second housing position information stored in said second housing position information storing step on the basis of said first housing position information stored in said first housing position information storing step and said first optical position information stored in said first optical position information storing step;

an estimated position information ~~producing~~ calculating step of ~~producing~~ calculating estimated position information indicative of a position of said calibrating marker to an image coordinate system of said imaging device on the basis of said second optical position information produced in said second optical position information producing step;

a second optical position information storing step of storing said second optical position information produced in said second optical position information producing step;

an estimated position information storing step of storing said estimated position information produced in said estimated position information estimating step; and

a calibrating step of calibrating said second optical position information stored in said second optical position information storing step on the basis of said image information of said calibrating marker obtained by said imaging device and said estimated position information stored in said position information storing step.

Claim 20 (Currently amended): A camera calibrating method of calibrating optical position information indicative of a position of an optical section supported by a housing unit of a camera for obtaining image information through said optical section, comprising:

a first housing position information storing step of storing first housing position information indicative of a position of said housing unit in the first coordinate system in which a revising marker is located;

a second housing position information storing step of storing second housing position information indicative of a position of said housing unit in the second coordinate system;

a first optical position information ~~producing~~ calculating step of ~~producing~~ calculating first optical position information indicative of a position of said optical section in said first coordinate system on the basis of said image information obtained by said imaging device and indicative of said revising marker;

a first optical position information storing step of storing said first optical position information produced in said first optical position information producing step;

a second optical position information ~~producing~~ calculating step of ~~producing~~ calculating second optical position information indicative of a position of said optical section to said second coordinate system from said second housing position information stored in said second housing position information storing step on the basis of said first housing position information stored in said first housing position information storing step and said first optical position information stored in said first optical position information storing step;

a second optical position information storing step of storing said second optical position information produced in said second optical position information producing step; and

a calibrating step of calibrating said second optical position information stored in said second optical position information storing step on the basis of a motion vector of said image information obtained by said imaging device in said second coordinate system,

wherein said calibrating step includes:

a plane-projected image producing step of producing a plane-projected image from said image information obtained by said imaging device in said second coordinate system;

a plane-projected image dividing step of dividing said plane-projected image produced by said plane-projected image producing step into a plurality of image segments;

a motion vector extracting step of extracting said motion vector from said image segments divided by said plane-projected image dividing step;

a calibration value calculating step of calculating a calibration value of said second optical position information stored by said second optical position information storing step on the basis of said motion vector extracted by said motion vector extracting step; and

a optical position information calibrating step of calibrating said second optical position information stored by said second optical position information storing step on the basis of said calibration value calculated by said calibration value calculating step.

Claim 21 (Currently amended): A camera calibrating method of calibrating optical position information indicative of a position of an optical section supported by a housing unit of a camera for obtaining image information through said optical section, comprising:

a first housing position information storing step of storing first housing position information indicative of a position of said housing unit in the first coordinate system in which a revising marker is located;

a second housing position information storing step of storing second housing position information indicative of a position of said housing unit in the second coordinate system in which an automotive vehicle is located;

a first optical position information ~~producing~~ calculating step of ~~producing~~ calculating first optical position information indicative of a position of said optical section in said first coordinate system on the basis of said image information of said revising marker obtained by said imaging device;

a first optical position information storing step of storing said first optical position information produced in said first optical position information producing step;

a second optical position information ~~producing~~ calculating step of ~~producing~~ calculating second optical position information indicative of a position of said optical section to said second coordinate system from said second housing position information stored in said second housing position information storing step on the basis of said first housing position information stored in said first housing position information storing step and said first optical position information stored in said first optical position information storing step;

an estimated position information ~~producing~~ calculating step of ~~producing~~ calculating estimated position information indicative of a position of said automotive vehicle to an image coordinate system of said imaging device on the basis of said second optical position information produced in said second optical position information producing step;

a second optical position information storing step of storing said second optical position information produced in said second optical position information producing step;

an estimated position information storing step of storing said estimated position information produced in said estimated position information estimating step; and

a calibrating step of calibrating said second optical position information stored in said second optical position information storing step on the basis of said image information of said automotive vehicle obtained by said imaging device and said estimated position information stored in said estimated position information storing step.

3. The following is an examiner's statement of reasons for allowance:

4. The prior art of record does not teach or render obvious the limitations as recited in independent claims 3 and 19, specific to the use of both a revising marker in the first coordinate system and a calibration marker in the second coordinate system, and calibrating the optical position information based on both markers.

5. The prior art of record does not teach or render obvious the limitations as recited in independent claims 8 and 20, specific to the details of the calibrating means.

6. The prior art of record does not teach or render obvious the limitations as recited in independent claims 11 and 21, specific to the use of both a revising marker in the first coordinate system and a automotive vehicle in the second coordinate system, and calibrating the optical position information based on both the marker and the vehicle.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Meyers whose telephone number is (571) 270-1690. The examiner can normally be reached on Mon-Thurs 8AM-5:30PM.

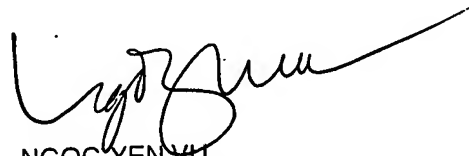
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NgocYen Vu can be reached on (571) 272-7320. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Application/Control Number:
10/512,039
Art Unit: 2622

Page 11

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

12/19/2007
JM



NGOC-YEN VU
SUPERVISORY PATENT EXAMINER